白瀬氷河における氷舌—海洋相互作用の現場観測

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Observations of ice tongue-ocean interaction at Shirase Glacier

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Shirase Glacier Tongue (SGT) is a thick floating slab of ice that forms where the glacier flows down onto the ocean surface at the southern closed-section of Lutzow-Holm Bay (LHB) off Enderby Land, East Antarctica. Compared with other major ice shelves/tongues around Antarctica, SGT is smaller in area but its basal melt rate was estimated to be relatively high at a rate of ~7 m per year (Rignot et al., 2013) based on presence of warm deep water. Although comprehensive hydrographic observations in LHB is indispensable for understanding the SGT-ocean interaction, they are extremely limited, with exception of those conducted by wintering party of the 31st Japanese Antarctic Research Expedition (JARE) in 1990/92. Detailed analysis of the JARE-31 winter hydrographic observations suggests a 3-dimenstional circulation, associated with the SGT-ocean interaction (Fig.1), that comprises: (1) warm modified CDW (Circumpolar Deep Water) flows southward at the deep layer of submarine canyon that leads into the region beneath SGT, (2) mCDW meets to melt the base of SGT, and (3) mixture of mCDW and basal melt water exports northward at subsurface layer.

To explore in detail the SGT-ocean interaction, summer comprehensive hydrographic observations in LHB were conducted during JARE-58 in 2016/17 under the project called ROBOTICA. The latest observation data show clear evidences for supporting the suggested SGT-ocean interaction mentioned above. Basal melt signals with elevated basal melt water fractions are clearly found in the temperature, salinity, and dissolved oxygen profiles, especially at subsurface layer (Winter Water) near the northern edge of the SGT.

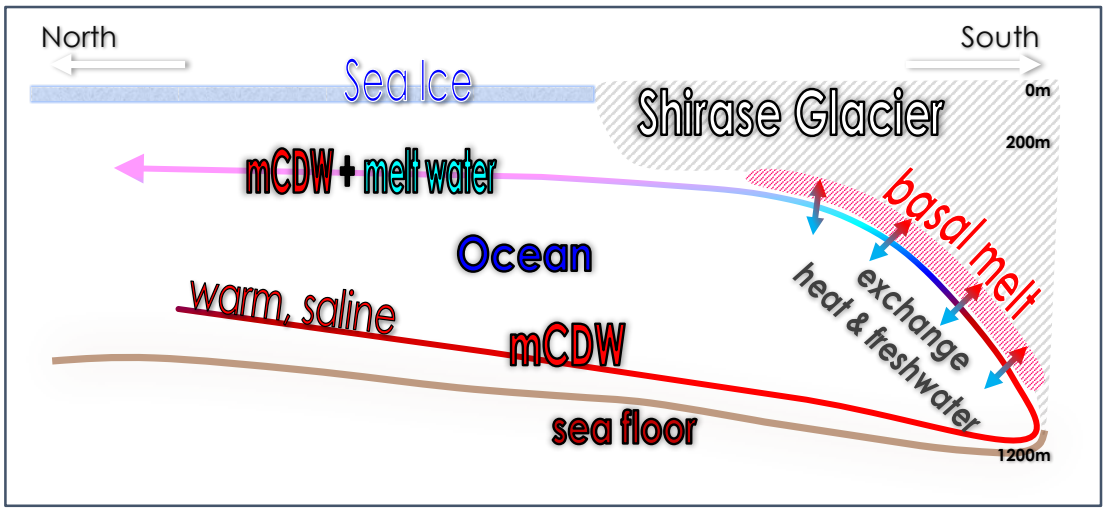

Fig.1: Schematic illustrating a 3-dimentional circulation associated with the SGT-ocean interaction.

References

Rignot, E., S. Jacobs, J. Mouginot, and B. Scheuchl, Ice-Shelf Melting Around Antarctica, Science, 341 (6143), 266-270 ,2013.